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ABSTRACT

This paper reports on a study of the effects of a Tennessee law aimed at increasing the protection of children in cars. The law, which came into force January 1, 1978, requires parents to use child restraints properly when transporting their children who are less than 4 years old. Alternatively, the law permits children to be held in arms, a practice known to be hazardous rather than protective. Before and after the law went into force, observations were made of children in cars exiting from shopping centers in Knoxville and Nashville in Tennessee and in Lexington and Louisville in Kentucky, an adjacent state not having a child restraint law. More than 80% of Tennessee children observed in the fourth month the law was in force were not using child restraints anchored by seat belts, although use rates increased in Tennessee (8% to 16%) to a greater extent than in Kentucky (11% to 15%). Moreover, due to a large increase in children traveling in arms in Nashville, there was an increase in such travel in the two Tennessee cities studied (23% to 28%) relative to a decrease in those studied in Kentucky (19% to 14%). Despite results of the Tennessee law thus far, seat belt legislation based on scientific knowledge concerning crash protection is potentially important as a means of increasing the protection of children in cars, and should be encouraged. (Author/BD)

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EVALUATION OF THE TENNESSEE CHILD RESTRAINT LAW

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Insurance Institute for Highway Safety

May, 1978

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EVALUATION OF THE TENNESSEE CHILD RESTRAINT LAW

Allan F. Williams, Ph.D.

Most infants and small children traveling in cars are unprotected from possible crash injuries, and effective ways to increase their protection are needed. In a survey conducted in 1974, 92% of 2,922 persons less than four years old observed in cars leaving amusement areas or shopping centers in three states were without restraints or were improperly restrained.[1] Even when parents driving the vehicles were themselves restrained, the majority of their sons and daughters traveling with them were unrestrained. Educational programs for parents have had little success in increasing proper use of child restraints.[2] Laws requiring proper use of child restraint systems are thus potentially important. At least some of the recent laws requiring seat belt use, enacted in various countries other than the United States, have been estimated to reduce motor vehicle occupant deaths, generally by 10% to 20%.[3] Unfortunately, most seat belt legislation has exempted children from restraint requirements.

In the state of Tennessee, a law intended to increase the protection of children in cars was signed by the Governor on April 27, 1977, and went into force January 1, 1978.[4] The law requires parents or legal guardians of children less than four years of age residing in Tennessee to use child restraint systems when transporting their children in motor vehicles owned by the parents, and to insure that the restraints are used properly. As an alternative to such travel, children covered by the law are permitted to be held

in the arms of older passengers. Recreational vehicles of the truck or van type, and trucks weighing one or more tons, are exempted. Fines for violations of the law are permitted to range from $2 to $10.

The Tennessee law could have a negative effect if it results in an increase in the number of infants and small children held in the arms of older passengers. Children traveling in arms or on the laps of adults are in double jeopardy in crashes: they cannot be restrained adequately, and in addition, are susceptible to injurious contact with the persons holding them.[5] If the persons holding children are unrestrained, as is typical[1], neither the movement of the children nor their holders is initially limited in crashes. Children are thus likely to contact interior vehicle structures and be injured, and holders are likely to crush the children against these structures, adding further injury. A number of cases involving fatal crash injuries to children on laps as a result of multiple crushing trauma have been documented.[5] In the much less frequent cases in which adults are restrained by seat belts, adult arms -- even if clasped firmly around the child — are not sufficiently strong to exert the momentary but huge retarding forces - often in the hundreds of pounds - commonly necessary to decelerate even the bodies of children in crashes.

The exemption of children in arms in the Tennessee law was added during debate on the Floor of the House of Representatives, over the objections of proponents of the law, who recognized that such exemption was inconsistent with the intent of the legislation. Legislative sponsors of the bill reportedly felt that it would be defeated without this exemption.[6]

Since the Tennessee legislation has potentially harmful effects, as well as the potential to increase the protection of children in cars, it is important that its effects be studied at an early date. In this paper, a study is reported of the effects of the law on Tennessee children traveling in cars in the fourth month the law was in force.

Methods

Observations of children traveling in automobiles were made about five months before the law went into force (July/August 1977) and in the fourth month after it was in force (April, 1978). Observations were made in Knoxville and Nashville in Tennessee and in Lexington and Louisville in Kentucky, an adjacent state that does not have a child restraint law. Data from the Kentucky cities were obtained to provide an indication of trends in child restraint use, unrelated to the law, occurring over this time period.

In each of the four cities, eight to ten shopping centers were selected, and observations were made at stop signs and stop lights at exits of the shopping centers. Observers posted at these sites scanned exiting cars for the presence of child passengers. If cars stopped at stop lights or stop signs contained one or more children that were possibly less than four years old, information was obtained from drivers of these vehicles on age of the children and their relationship to the driver, and observations on how children were traveling were made and recorded. Very few drivers refused to provide the information requested.

If child restraints were in use, it was observed whether they were anchored by vehicle seat belts. Use of seat belts in conjunction with child

restraint systems is an essential component of their proper use, as required by the Tennessee law. If seat belts are not fastened around the devices, the protection otherwise provided is greatly reduced or eliminated.

In Tennessee, only children in cars with Tennessee license plates were included in the analysis, and, to insure comparability, the Kentucky data were limited to children in cars with Kentucky plates.

Results

Observations were made of 2,816 automobile passengers reported to be less than four years old who were traveling in in-state vehicles in Tennessee and Kentucky. In Tennessee 731 children (353 in Knoxville, 378 in Nashville) were observed in the pre-law period, and 861 (407 in Knoxville, 454 in Nashville) in the post-law period. In Kentucky, 433 pre-Tennessee law observations (198 in Lexington, 235 in Louisville) and 791 post-Tennessee law observations (395 in Lexington, 396 in Louisville) of children were made.

In Figure 1, information is presented on proper use of child restraint systems five months before the Tennessee law went into force, and in the

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Figure 1 about here

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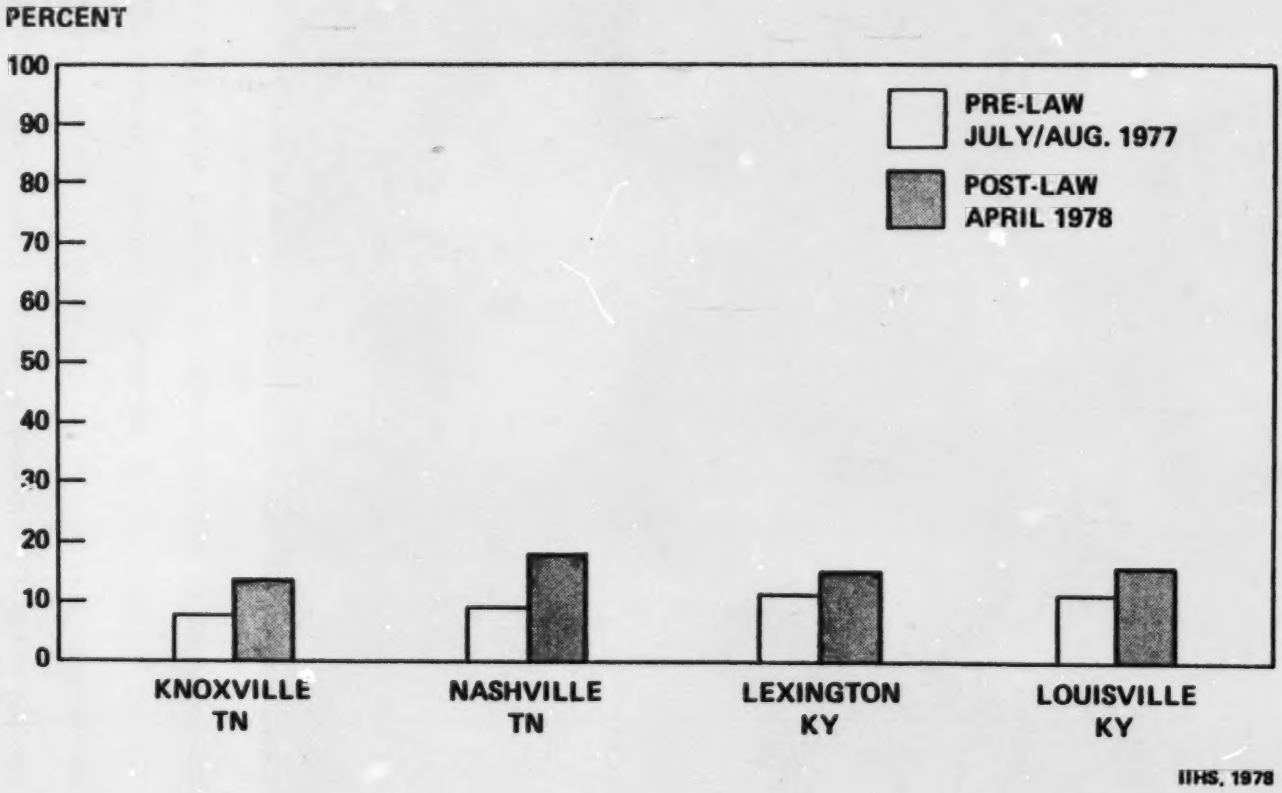
fourth month the law was in force. Use of child restraints anchored by vehicle seat belts increased in all four cities. The increases in Tennessee cities (7% to 14% in Knoxville, 9% to 18% in Nashville) were somewhat greater

Figure 1

Percent use of child restraints anchored by seat belts before and after Tennessee law in force (Jan. 1, 1978)



than the increases in Kentucky cities (11% to 15% in Lexington, 11% to 16%) in Louisville). With cities combined, use of child restraints anchored by seat belts increased from 8% to 16% in Tennessee, and from 11% to 15% in Kentucky.

Children whose parents were driving comprised 76% of the total sample. When only such children were included, use rates of child restraints anchored by seat belts were slightly higher in all four cities than rates based on all children, and increased from 9% to 18% in Knoxville, 10% to 21% in Nashville, 13% to 18% in Lexington, and 14% to 19% in Louisville.

In the above analyses, child restraints not fastened by vehicle seat belts were excluded. When all child restraints -- irrespective of proper use -- are included, use rates increased from 11% to 20% in Knoxville and 12% to 21% in Nashville, whereas use rates in the Kentucky cities showed little change: 18% at both observation periods in Lexington, and 17% to 18% in Louisville.

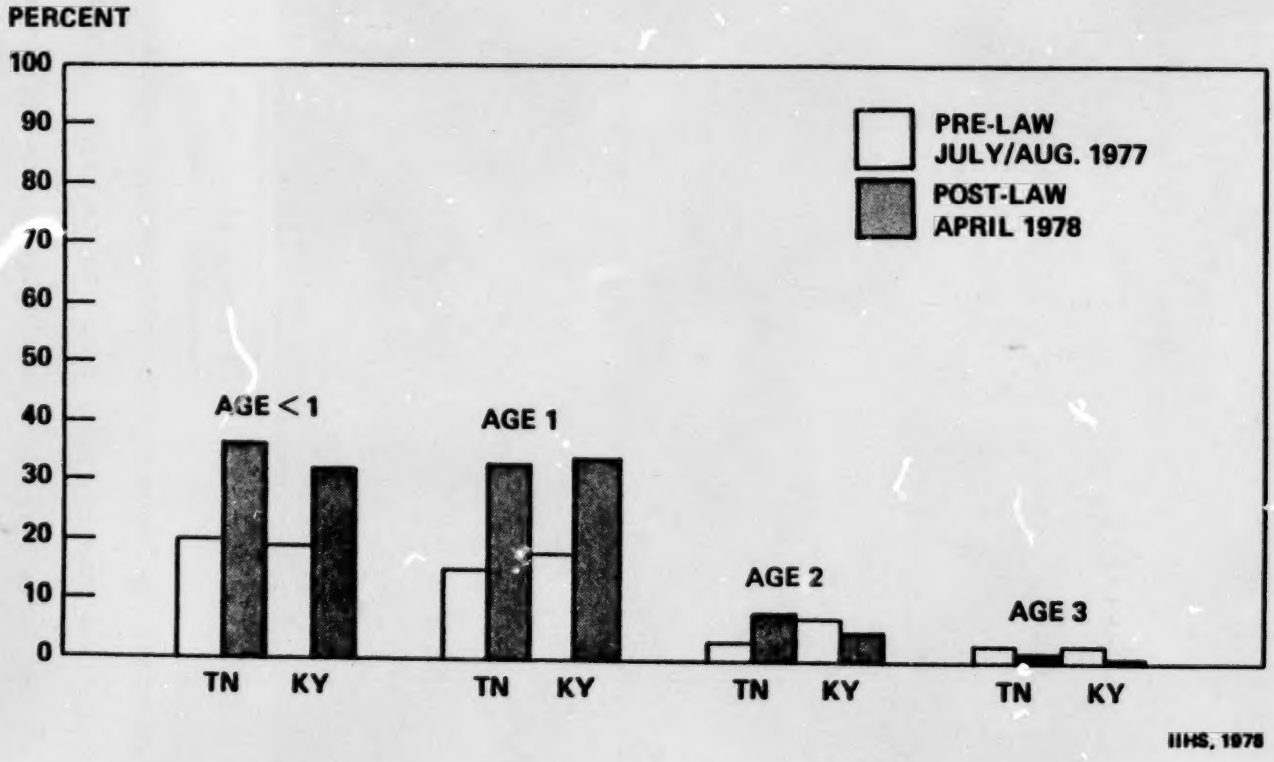
In Figure 2, use of child restraints anchored by seat belts is shown for the four separate age groups covered by the Tennessee law. Cities

Figure 2 about here

are combined in this analysis but in each state the findings were very similar for both cities surveyed. Figure 2 shows that child restraint use is strongly related to age and drops off sharply after age one, a finding noted in previous studies.[1] Among one year-olds and those less than one, there were increases in both states in use of child restraints

Figure 2

Percent use of child restraints anchored by seat belts before and after Tennessee law in force (Jan. 1, 1978), by age



anchored by seat belts, the increases in Tennessee being slightly greater than the increases in Kentucky. Use rates for those less than one year old increased from 20% to 36% in Tennessee and from 19% to 32% in Kentucky; and from 15% to 33% in Tennessee and 18% to 34% in Kentucky for one year-olds. Among two year-olds, use rates increased from 3% to 8% in Tennessee and decreased slightly in Kentucky (7% to 5%), and at age three use rates were minimal (3% or less) in both states before and after the Tennessee law went into force.

In Figure 3 rates of children observed traveling in arms or on laps -- permitted by the Tennessee law -- are presented. Such travel declined

Figure 3 about here

somewhat in Knoxville and in both Kentucky cities surveyed, but increased substantially in Nashville, from 24% to 38%. The net result was an increase in in arms/on laps travel in Tennessee (23% to 28%) relative to a decrease in comparable areas in Kentucky (19% to 14%).

Figure 4 provides a breakdown of in arms/on laps travel in Nashville by ages of child passengers. Rates of traveling in arms or on laps before

Figure 4 about here

and after the law went into force remained approximately the same among those less than two years old. The increases in such travel occurred among two and three year-olds, resulting in much higher rates for these age groups than was observed in the other cities surveyed or in previous

Figure 3

Percent traveling in arms or on laps before and after Tennessee law in force (Jan. 1, 1978)

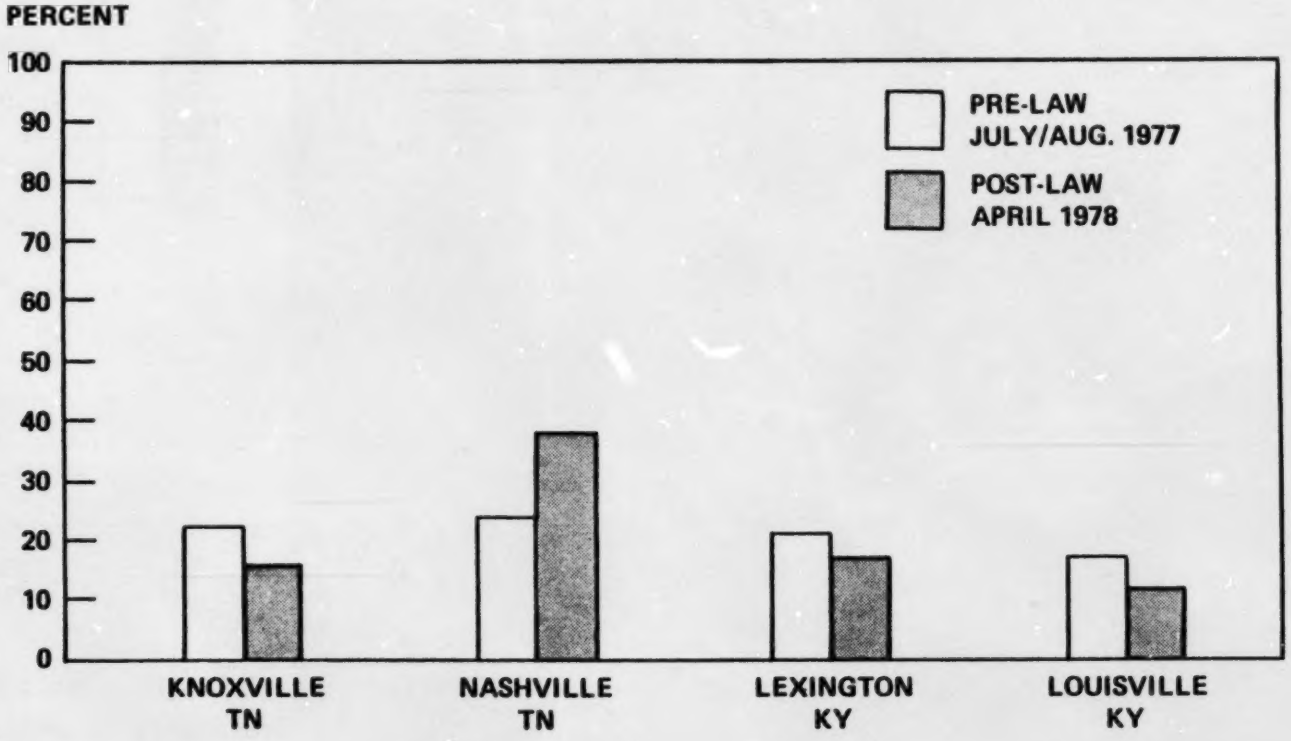
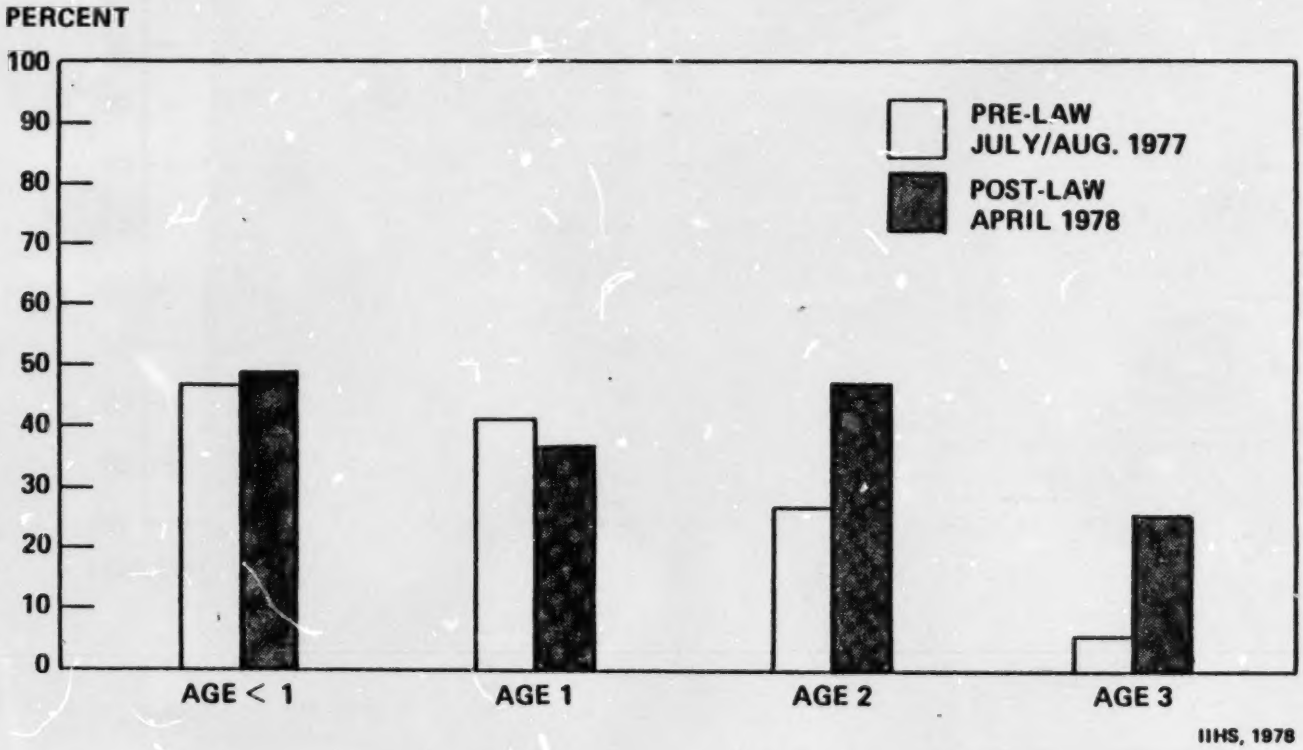


Figure 4

Percent traveling in arms or on laps in Nashville before and after Tennessee law in force (Jan. 1, 1978), by age



surveys.[1] For example, in the post-Tennessee law period rates of in arms/on laps travel ranged from 9% - 10% among two year-olds observed in the other three cities, compared to 47% in Nashville; and from 2% to 4% for three year-olds in the other cities, compared to 26% in Nashville.

Most of the other children observed in Tennessee and Kentucky were sitting or standing by themselves, unrestrained. A few (3% overall) were in inadequate devices not designed to provide crash protection and not permitted by the law, and a very few (1%) were sitting on vehicle seats using seat belts.

Discussion

In the fourth month that the Tennessee child restraint law was in force, proper use of child restraint systems had not increased greatly, and the potential of the law for harm because of increased travel in arms or on laps cannot be discounted. More than 80% of Tennessee children observed were not using child restraints anchored by seat belts, although use rates had increased in Tennessee cities to a greater extent than in comparable Kentucky cities not affected by the law. Use rates were particularly low at ages two and three.

In the present survey, use of vehicle seat belts in conjunction with child restraints was the only criterion for their proper use, as required by the Tennessee law. Rates of proper use of child restraints would have been lower than those reported in this paper had other criteria for their proper use that would provide additional crash protection been included, such as appropriately fastening straps or harness systems usually provided on the devices.

In Nashville -- but not in Knoxville or in the Kentucky cities -- there was a substantial increase in traveling in arms or on laps among two and three year-olds subsequent to the law. Almost 4 in 10 children less than four years old observed in Nashville were traveling in arms or on laps in the fourth month of the law. Why increases in such travel occurred in Nashville but not in Knoxville is unclear. However, it should be noted that an extensive public information and education campaign concerning the law had begun in Nashville before the post-law observations were made. This campaign is not to be launched in other urban areas of Tennessee, including Knoxville, until later dates. The public information campaign material does not mention travel in arms as an option under the law. However, there is the possibility that as general awareness of the law increases, travel in arms or on laps will also increase, in addition to or instead of child restraint use. This may also occur in response to police enforcement of the law, which had not yet begun. In any case, the hazards of traveling in arms or on laps have been well documented, and it is important that consideration be given to removing this unfortunate exemption to the law as soon as possible.

Despite the results thus far in Tennessee, seat belt legislation remains a potentially important strategy for increasing the protection of children in cars, and should be encouraged. The tremendous efforts involved in Tennessee on the part of pediatricians and others, that culminated in passage of initial child restraint legislation in the United States, are noteworthy[6], and other states reportedly are now considering such legislation. It is essential, however, that child restraint laws be based on scientific knowledge concerning crash protection. For example, not only

should travel in arms or on laps not be allowed, but seat belt use should be an option for at least those two and three years old, who rarely use child restraints and who are afforded more crash protection by seat belts than they receive riding without them.[7]

It is also important that laws requiring child restraint use not be considered alternatives to crash protection strategies that do not require the active cooperation of parents and children, such as increasing the crash padding of vehicle interiors, and air bags, that work automatically when needed.[1,2,5,8,9]

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